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FRENCH'S SHOOTING STAR IN SOUTHERN ILLINOIS

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FRENCH'S shooting star *Dodecatheon frenchii* (Vasey) Rydb.¹ is of local interest. It was first discovered and named for George Hazen French an early teacher of biology at Southern Illinois State Normal (now Southern Illinois University), at Carbondale, Illinois. A specimen bearing the date 1870 is located in the herbarium of Southern Illinois University. The label bears the following inscription, "Dodecatheon Frenchii V., this is thought to be a new species as it differs much from *D. meadia*." The word type is written on the sheet near the label. The species name, authority initial and the word type are written in pencil while the label is written in ink. The specimen is in a fruiting condition. A second sheet collected on May 6, 1871, also from "Fern Rocks" is probably of the same collection as that marked type at the Chicago Natural History Museum. According to Fassett (1944) the sheet at Chicago was designated the type presumably by McBride. The original description did not designate a type or date of collection. The earliest collection date previously stated in print was 1871. Thus the 1870 date on the type specimen establishes the date of collection of the type series as one year earlier than previously indicated.

The last complete work on the genus in eastern North America was that of Fassett (1944). Before Fassett's treatment French's shooting star had been known at different times as a variety, subspecies, and species. On the basis of Fassett's work French's

¹ The nomenclature is that of Jones 1950. Flora of Illinois, University of Notre Dame Press, Notre Dame, Ind.

shooting star has been accepted by many as a variety of Mead's shooting star (*D. meadia* L.).

Dodecatheon frenchii has been described as a plant having "leaves abruptly narrowed to the petiole . . . extreme plants with broad oval subcordate blades. The inclusion of all plants with leaves tending to be abruptly narrowed to the petiole has led to various interpretations of range as being much wider than it is" (Fassett, 1944). Vasey gave the range as Pennsylvania to southern Illinois and Arkansas. Rydberg (1932) gave it as Illinois, Minnesota, Arkansas, and Pennsylvania. Fassett (1944) restricts the range to the Illinois Ozarks with a single specimen of doubtful determination being cited from Wisconsin. Recent intensive searches in southern Illinois for the plant recognized by Fassett as *D. frenchii* show that it is restricted to a belt of about 10 miles width across the State (Fig. 1).

Dodecatheon frenchii has always been found in canyons of streams flowing primarily southward and under sandstone ledges which may face any direction. It is found most often under north and east facing bluffs. *D. meadia* is found in several central and northern counties of Illinois, in the Illinois Ozarks and southward.

It has been reported that *D. frenchii* differs genetically from the widespread phases of *D. meadia*, but that special ecological conditions are required for a phenotypic expression of the varietal phase (Fassett, 1944). He also reported that *D. frenchii* is changed to the likeness of *D. meadia* when grown under increased amounts of light and a longer light period. *D. meadia* is reported to be replaced by, or to grade into, *D. frenchii* under cliffs and shaded places. This ecological behavior has not been noted by us. The plants have been found to be distinct. The discovery of *D. frenchii* in open well-lighted upland woods at Jackson Hollow still maintaining its distinctive vegetative characteristics demonstrates that this plant may occasionally be found away from the cliff habitat though it exhibits a strong "preference" for it. It also shows that the leaf-shape which so characterizes this taxon may also be manifested in brighter light and that reduced light is not necessary for its phenotypic expression. These plants were growing some fifty yards from the cliff where other plants of *D. frenchii* were growing.

Light readings in the habitat of *D. meadia* ranged from 5,000

to 6,000 foot candles when readings in the open recorded 10,000 foot candles. The readings in the habitat of *D. frenchii* were usually about 14–25 per cent less than the light recorded in the habitat of *D. meadia*. The light meter was held directly over the plants in such a position as to receive the fullest amount of sunlight. In addition to these readings, which were taken from several locations, the light was measured in the upland habitat of the open woods where about 40 plants of *D. frenchii* were found growing at Jackson Hollow. Over a five hour period seven readings were made. The average of these read-

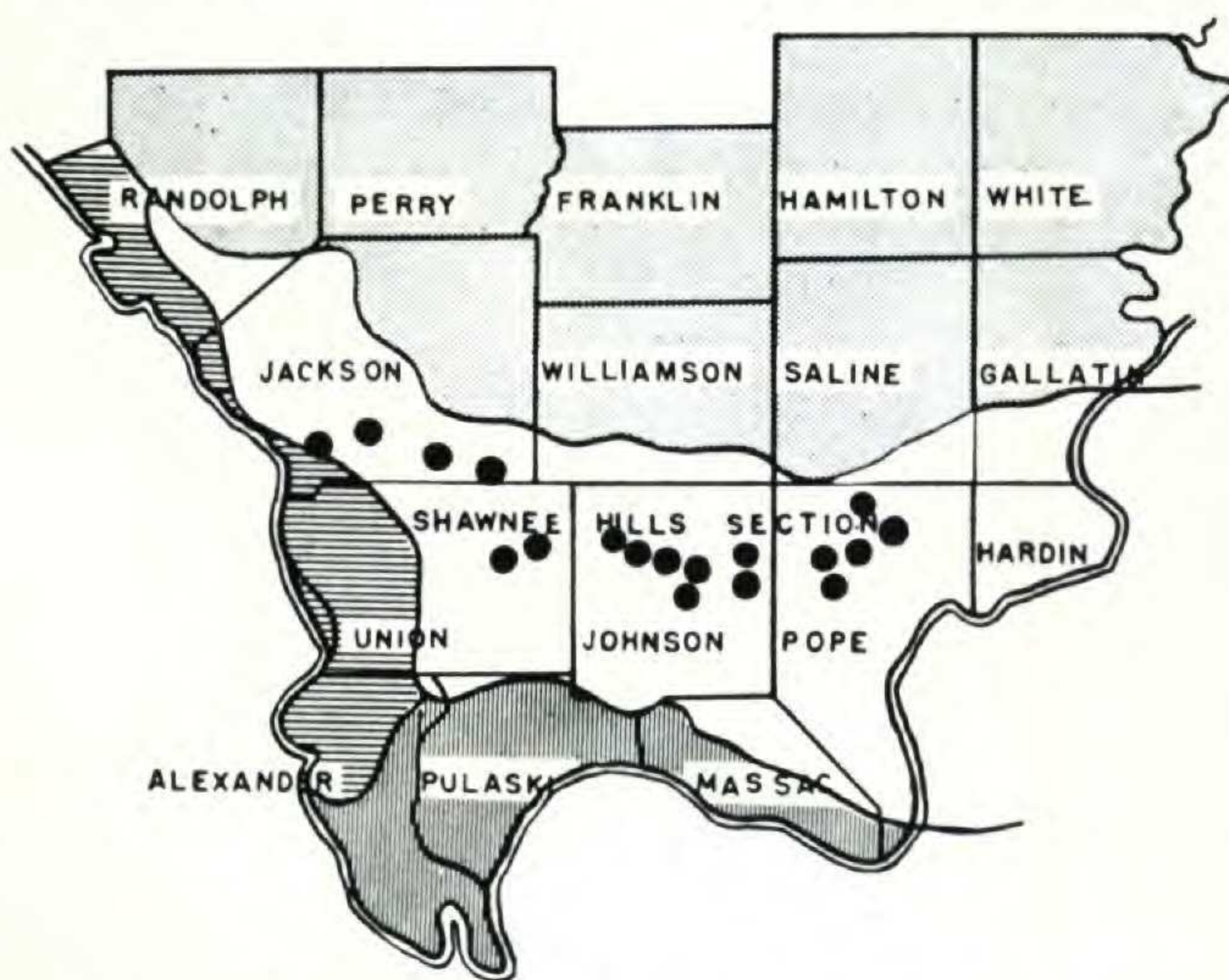


Fig. 1. The southern sixteen counties of Illinois. The white area represents the Shawnee Hills Section. The area to the north is glaciated. Dots represent stations for the occurrence of *D. frenchii*. Horizontal hatch is the Salem Plateau section; vertical hatch is the Coastal Plain province. Map adapted from Leighton, Ekblaw, and Horberg.

ings, where most of the plants were growing, was about 5,000 foot candles. The readings were started at 11:00 a.m. and terminated at 4:00 p.m. The average of seven readings over the same period of time for a station 3 feet distant from the first, where a few more plants were growing, was about 6,500 foot candles. It is realized that averages of factor intensities are ordinarily of little value, but here the amount of light and its duration is equivalent to and often exceeds that found in the habitats of *D. meadia*. Light readings taken under the bluff and down the hill some 50 yards away where most of the *D. frenchii* plants were growing, showed only 11 foot candles at the edge of the bluff. At 3:45 p.m. the reading here was only 8–10 foot candles. The plants growing under the bluff

never receive direct sunlight and for only half of the day do they receive as much as 200 to 300 foot candles.

The effect of increased lighting on *D. frenchii* and decreased lighting on *D. meadia* was studied in the greenhouse. Several dozen resting buds of *D. frenchii* and *D. meadia* were collected on January 17, 1952 and planted. The natural light was supplemented by two fluorescent tubes (30 watt) which were placed over the plants at a distance of about 20 inches. The total day length period was 15 hours. The greenhouse temperatures were set for 60 degrees at night and 80 degrees during the day. The plants appeared above ground in about a week, grew rapidly and initiated flower stalks at the end of the third week. The buds opened into flowers during the sixth week at which time the plants were harvested. The time for the development and appearance of flowers was close to that required in nature. No important differences of leaf shape were noted between these plants and any others of *D. frenchii* that had been seen. Both taxa were subjected to diminished light by placing the same number of resting buds of each under a cubicle of plastic material which reduced the light to about 25 per cent of full sunlight. The only major change was in the length of the leaves of *D. meadia*. They became longer and thinner but did not otherwise change shape or bear any likeness to *D. frenchii*.

The plants of *D. frenchii* and *D. meadia* were started again after 2 months of storage in the bottom of a refrigerator. They were once more subjected to increased lighting and started their vegetative growth promptly. This time they were grown under three mazda bulbs (300 watts each). The bulbs were approximately 3 feet from the plants, and timed for a 15 hour day. These plants also showed no change of leaf shape. A third trial was made, following the same procedure as in the second, and again negative results were obtained.

Fassett's observation of intergradation of *D. frenchii* with *D. meadia* or the change of leaf shape of *D. frenchii* to the likeness of *D. meadia* is suspected to be due to the variation of the populations of *D. frenchii*. A considerable number of plants in any population of *D. frenchii* will be found to vary some in leaf shape. However when plants that are growing side by side show leaf shape variation which does not approach the shape, color, or texture of leaves of *D. meadia* then one wonders what

environmental influences can be so subtle as to change the leaves of one *D. frenchii* plant and not another growing next to it.

Other environmental factors were investigated. These included measurements of organic matter, moisture content, pH, evaporation, temperature and humidity. Only the last three factors showed any appreciable differences in the two habitats. The maximum difference in temperature for any 24 hour period was 12 degrees Fahrenheit, and the average over a 5 week period was 7.5 degrees. The lower temperature always prevailed in the habitat of *D. frenchii* as did the higher humidity and lower evaporation rate.

MORPHOLOGICAL ANALYSIS

The shape of the leaf in both taxa has been found to be distinct and unchanged by a change in the lighting of the environment. When width of leaves is plotted against the length of leaves on logarithm paper for both taxa the points for each fall mostly on separate straight lines. These slope determinations, figured by least squares, were 0.9 for *D. frenchii* and 0.88 for *D. meadia*. Measurements were made from 201 samples of which 126 were for *D. frenchii* and 75 were for *D. meadia*. The samples were random and from all known stations. A few points from this plotting do fall between the two slope lines indicating

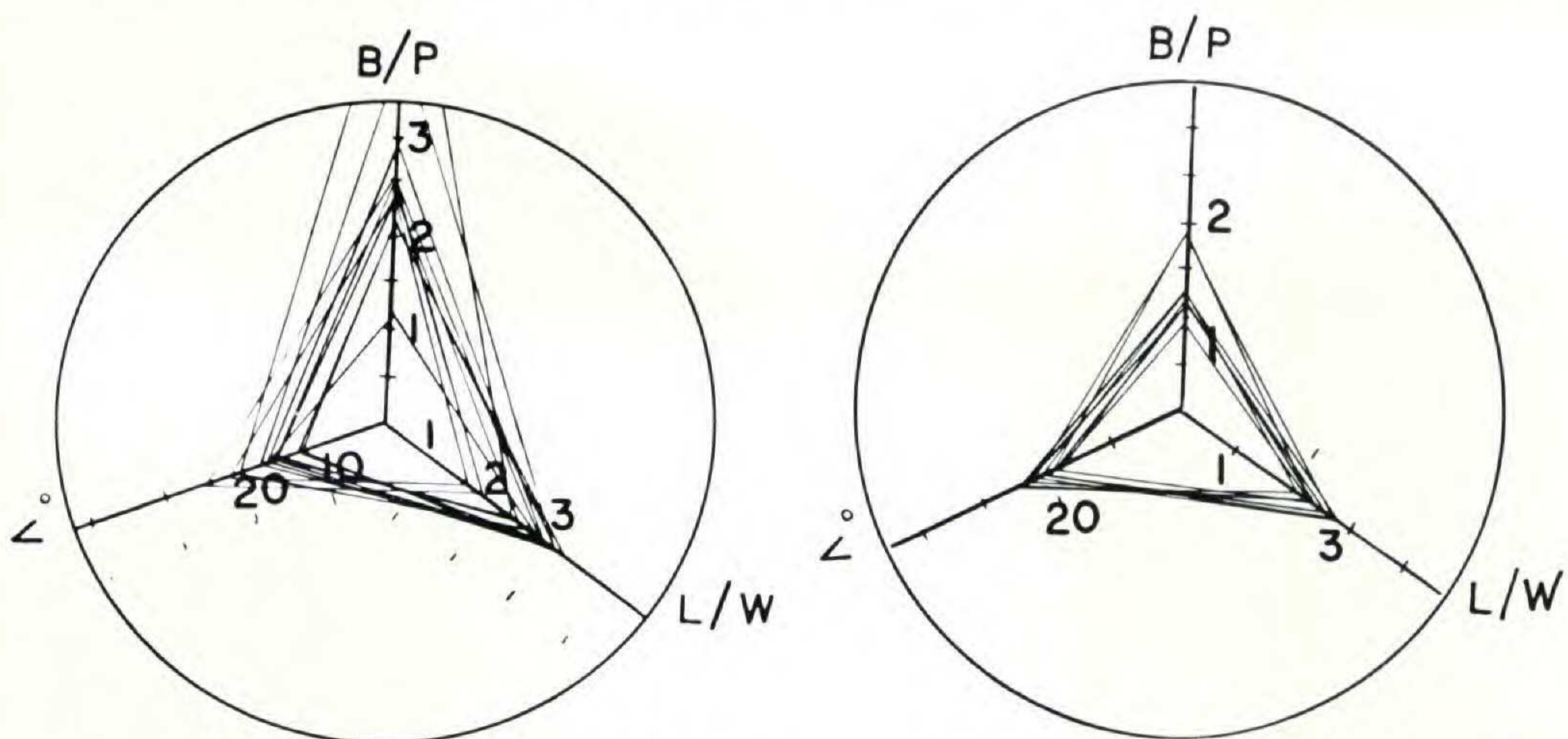


Fig. 2a. Polygonal graph showing blade/petiole, length/width relationships and angle of contraction of blade to petiole of leaves of *D. meadia* which seemed "intermediate" by logarithmic plotting of length vs. width of leaves.

Fig. 2b. Polygonal graph showing relationships of blade/petiole, length/width and angle of contraction of blade to petiole of *D. frenchii*. These measurements were selected from leaves of plants which were "intermediate" in logarithmic plotting of length vs. width of leaves.

that some leaves of each taxon are intermediate as to length and width. The length-width relationship of the leaves however does not show the character that is most important in distinguishing the two taxa, namely, the abrupt angle of contraction of blade of leaf to the petiole in *D. frenchii*.

The angle at which the blade joins the petiole was calculated for both taxa from the individuals which seem to be intermediate by the logarithmic plotting of length vs width of leaves. The measurement of the angle of contraction of blade to petiole was done according to the method of Voigt (1952). The individuals which seem to be intermediate as to leaf length and width were plotted on polygonal graphs (fig. 2a & b) and are seen to be distinctly different.

The blade-petiole ratio (B/P) was always greater for *D. meadia*. The length-width (L/W) ratio was also more variable for *D. meadia*. The angle (\angle) of contraction made by the base of the blade to the petiole was always greatest for *D. frenchii*. Polygonal projection of other individuals whose measurements fall more closely to the slope lines would only have these differences more greatly emphasized. This method of graphing has the advantage of giving an objective comparison while portraying several characters (Davidson, 1947). When the graphs of the

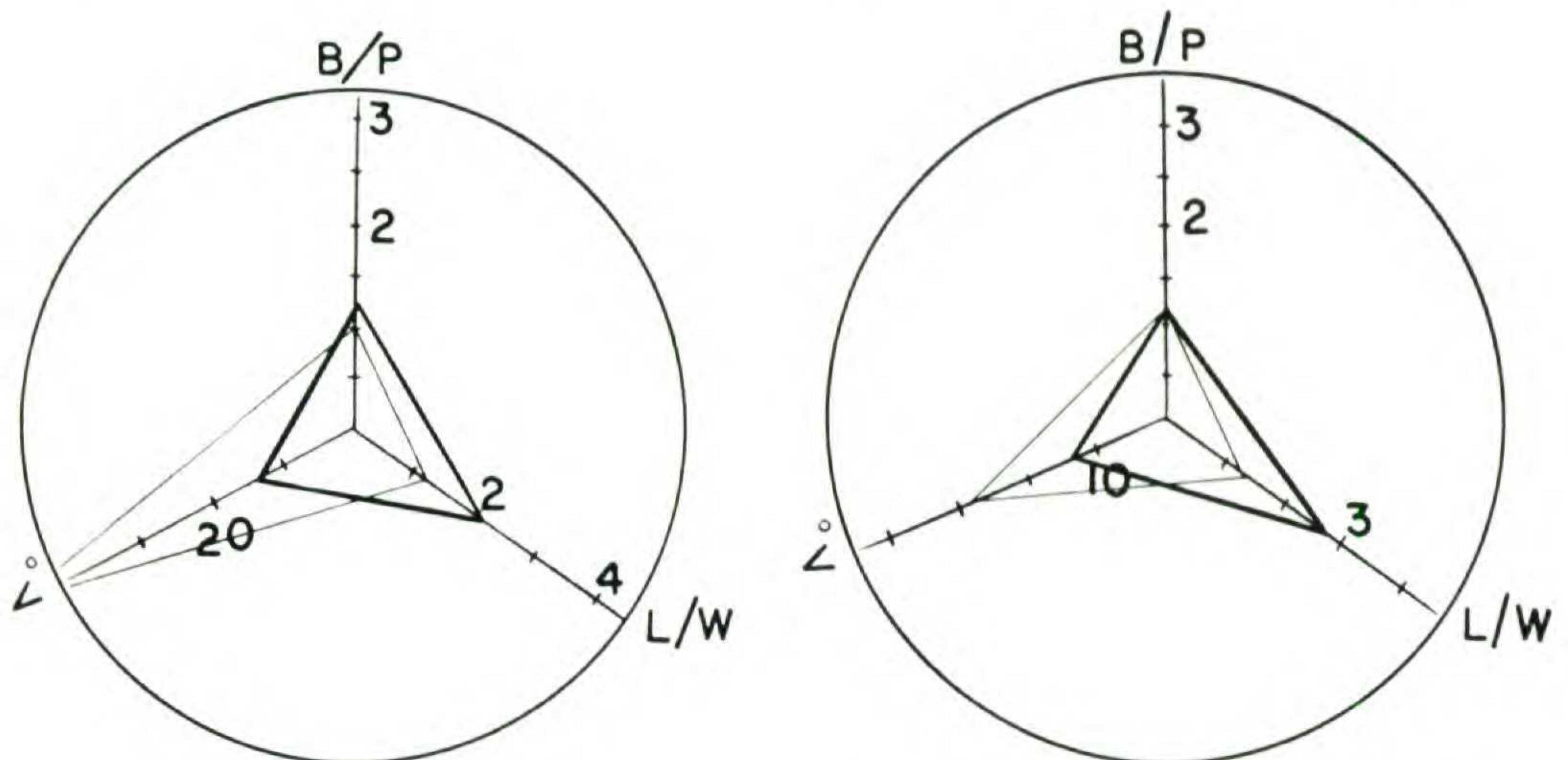


Fig. 3a. Polygonal graph showing morphological comparison of leaves of *D. meadia* and *D. frenchii* found growing in the same habitat. The individuals were six feet apart. Measurements were made of blade/petiole, length/width, and angle of contraction of blade to petiole. Heavy line is for *D. meadia*.

Fig. 3b. Polygonal graph as previously done. The plants were found in the same area fifteen feet apart. The heavy line is for *D. meadia*.

two entities are superimposed a high degree of crossing of the lines emphasizes remoteness of morphological similarity whereas a high degree of paralleling denotes a closer morphological similarity.

Measurements made in the manner just described are shown (fig. 3a) for *D. frenchii* and *D. meadia* growing together in the same habitat. Single individuals are shown. In each case only one individual of *D. meadia* was found. The plants rarely occur in the same habitat (in two cases, the habitat was that of *D. frenchii*). The nearest plant of *D. frenchii* to the single individual of *D. meadia* was selected for comparison. The distance apart in fig. 3a was 6 feet, and in fig. 3b the distance was 15 feet. In both instances the distinctness is quite apparent.

Colonies of *D. frenchii* are not usually recognized by the color of the corolla lobes because white corolla lobes are found in nearly every plant. A dark purple color as given by Rydberg (1932) and Jones (1950) has not been found in the corolla lobes of *D. frenchii*.

Plants of *D. frenchii* transplanted into the habitat of *D. meadia* at Giant City State Park in Illinois have remained distinct through three seasons of growth. They flowered in the third year. Plants of *D. meadia* transplanted into the habitat of *D. frenchii* have remained distinct as to leaf shape and have even retained their darker color. The leaves did become thinner.

A change of *D. meadia* into *D. frenchii* has not been observed. The vegetative morphological distinctness together with the lack of intergrading forms and the differences in ecological behavior of these presumed species are probably significant. However, a more complete investigation including genetic and cytological studies are required for a final determination of the taxonomic status of these taxa.

Detailed collection data are on file at the herbarium of Southern Illinois University. As indicated by the map (fig. 1) stations for *D. frenchii* are known from Jackson, Union, Johnson and Pope Counties.—SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE, ILLINOIS.

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PEDANTICISM RUNS AMUCK

H. A. GLEASON

It is now seventeen years since the article* was published and for seventeen years I have considered a reply to it. At first I remained silent out of respect to my friend Alfred Rehder, who was unfortunately, and I suspect rather unwittingly concerned with it.

The title of the paper is misleading. Botanists who may at this point fear that they have been asked or will now be asked to learn a fourth name for this beautiful, valuable, and widely distributed tree may be at ease. The article leaves the name *Pseudotsuga taxifolia* unchanged and refers only to the author-citation for it, that is, to the botanists who are responsible for the name in the recommended form. Nevertheless it is significant that the authors betray in their title something of the growing tendency to convert the ordinary binomial system of nomenclature into a trinomial or quadrinomial system, in which the "authorities" constitute the third and fourth terms. Every teaching taxonomist still tells his students that the name of a species consists of two terms which together are sufficient to designate the species and at the same time show something of its place in the scheme of classification. The International Code, in the formation of which the authors played such a prominent part, still affirms the binomial system. But this growing tendency is often apparent.

Since the Kew Bulletin, as well as the original sources on which Sprague and Green base their conclusions, may not be

* SPRAGUE, T. A., AND M. L. GREEN. The botanical name of the Douglas Fir. *Kew Bulletin* **1938**: 79, 80. 1938.